FINAL REPORT

Microbiological Sampling Report

for

National Oceanic & Atmospheric Administration

Samplings Conducted at

Buildings SSMC-2, -3, and -4

on July 26, 2000

Interagency Agreement #: D8H01CO31200

Task: 9903

October 24, 2000

Prepared by
US Public Health Service
Division of Federal Occupational Health
Bethesda Central Office

Executive Summary

At the request of the National Oceanic & Atmospheric Administration (NOAA), Federal Occupational Health (FOH) conducted microbiological air samplings on two floors each of Building SSMC-2, SSMC-3, and SSMC-4, located at 1325, 1315, and 1305 East-West Highway, Silver Spring, Maryland, respectively. The sampling floors were (1) the "target" floor where personnel from the Foulger Pratt conducted adjustment of VAV boxes located at the ceiling plenum, and (2) the floor underneath and served as "reference". The specific floors for each building were 17th and 18th floors of SSMC-2, 14th and 15th floors of SSMC-3, and 11th and 12th floors of SSMC-4. Air (both Andersenâ and Zefonâ) samples were collected on July 26, 2000. Air samples were also collected from outdoors at entrance areas of SSMC-2 and SSMC-3.

Mean indoor airborne fungal and spore levels were lower than those of outdoors. Fungi and spores detected indoors were similar to those of outdoors. With limited air sampling results from each building, no fungal level difference was detected between the "target" floor and the "reference" floor.

INTRODUCTION

At the request of the National Oceanic & Atmospheric Administration (NOAA), Federal Occupational Health (FOH) conducted microbiological air samplings on two floors each of Buildings SSMC-2, SSMC-3, and SSMC-4, located at 1325, 1315, and 1305 East-West Highway, Silver Spring, Maryland, respectively. The sampling floors were (1) the "target" floor where personnel from the Foulger Pratt conducted adjustment of VAV boxes located at the ceiling plenum, and (2) the floor underneath and served as "reference". The specific floors for each building were 17th and 18th floors of SSMC-2, 14th and

15th floors of SSMC-3, and 11th and 12th floors of SSMC-4. Air (both Andersenâ and Zefonâ) samples were collected on July 26, 2000. Air samples were also collected from outdoors at the entrance areas of SSMC-2 and SSMC-3.

EVALUATION METHODOLOGY

Air Samples

Sampling locations of the "target" floors were selected where the green tags on the ceiling tiles indicating that the VAV boxes had been adjusted Sampling locations for reference floors were randomly selected. On July 26, 2000, two types of air samples were collected from each sampling location: (1) culturable method using Andersenâ N-6 samplers at a flow rate of 28.3 L/min, and (2) non-culturable method using Zefonâ Air-O-Cell cassettes at a flow rate of 15 L/min. Indoor Andersenâ air samples were collected for three minutes and outdoor samples were collected for both one and three minutes. Two percent (2 %) malt extract agar (MEA) was used to recover general fungi. Non-culturable air samples were collected at the aforementioned sampling locations. Indoor samples were collected from ten minutes and outdoor samples were collected for five minutes. Outdoor air samples were collected near the entrance of the buildings SSMC-2 and SSMC-3. Temperature and relative humidity measurements were collected from each air sampling location by a battery operated, direct readout Hygroskopâ meter.

All samples collected were sent for next morning delivery to FOH's Environmental Microbiology Laboratory (EML) in Philadelphia, Pennsylvania for analysis.

Laboratory Procedures

Upon receipt, all Andersenâ air samples were incubated in a 25˚C incubator. They were examined every other day for up to seven days to ensure the full recovery of fungi. Fungal identification was based on colony morphology, spores and conidia formation. Total fungal colonies formed on each MEA plate were counted and recorded. Fungal levels in samples were presented as colony forming units (CFUs) per meter of air (CFU/m^3).

_All Zefonâ cassette samples were analyzed by the Environmental Microbiology Laboratory in Escondido, California for direct microscopic examination. Fungal spores were counted and identified, and their airborne levels were presented as $spores/m^3$.

RESULTS AND DISCUSSION

Temperature and Relative Humidity

Indoor temperature and relative humidity measurements ranged from 71.6°F to 76.3°F, and 37.0% – 50.8%, respectively (Table 1). Outdoors temperature reading was within the same range, while higher relative humidity was recorded (75.6% - 81.9%).

Microbiological Analyses Results

The laboratory analytical report #NOAA-00-48R from FOH's EML is presented in Attachment A. Results from microscopic examination of Zefonâ cassette samples are presented in Attachment B.

Andersen Results

Overgrowth of the three-minute outdoor samples were detected, thus only the one-minute outdoor samples were analyzed. Mean outdoor airborne fungal levels (4,435 CFU/m^3) were higher than those of indoors (Table 1). Indoor airborne fungal levels were low, ranging from below the detection limit of 12 CFU/m^3 to 130 CFU/m^3. Mean indoor fungal levels on each floor/building varied from 17 CFU/m^3 to 112 CFU/m^3 (Table 1). No statistical difference ($p > 0.05$) was detected on fungal level of the "target" and "reference" floors.

Basidiomycetes dominated outdoor fungal flora. Other fungi detected from outdoors were *Cladosporium, Aureobasidium, Aspergillus,* and *Mucor*. Basidiomycetes were also the predominant fungi detected indoors, followed by *Cladosporium.*

Zefon Results

Mean outdoor fungal spore level was much higher than means of indoors at different floors (10^3 spores/m^3 vs. 10^1 spores/m^3) (Table 1). Indoor fungal spore levels ranged from below the detection limit of 7 spores/m^3 to 201 spores/m^3.

Cladosporium was the predominant fungal spore type recovered indoors followed by *Pithomyces*. Spores of Basidiomycetes and Ascomycetes dominated outdoor spore flora. Spores of *Cladosporium* and *Pithomyces* were also detected outdoors.

CONCLUSIONS

Mean indoor airborne fungal and spore levels were lower than those of outdoors. Fungi and spores detected indoors were similar to those of outdoors. With limited air sampling results from each building, no fungal level difference was detected between the floor with activity and the reference floor.

ATTACHMENT A

Microbiological laboratory report for samples collected from SSMC-2, SSMC-3, and SSMC-4 on July 26, 2000.

ATTACHMENT B

Results from microscopic examination of Zefon air samples collected from SSMC-2, SSMC-3, and SSMC-4 on July 26, 2000.

USPHS DFOH ENVIRONMENTAL MICROBIOLOGY LABORATORY, PHILADELPHIA, PA

LABORATORY REPORT #NOAA-00-48R

Client agency: National Oceanic and Atmospheric Administration, Silver Spring, MD

POIS#/task #: D8H00CO31200 / 9903

Sampling date: 7/26/00

Date of inoculation: 7/26/00

General locations: SSMC-2, SSMC-3, and SSMC-4, Silver Spring, MD

Specific locations: SSMC-2, 11th & 12th floors; SSMC-3, 14th & 15th floors; SSMC-4, 17th & 18th floors

Sampling technique: Air (Andersen N-6 sampler) sampling

Medium used: Malt extract agar (MEA) for fungi

Samples submitted by: L. Hung and C. Preto

Date characterization completed: 8/2/00

Air samples on MEA plates

Sample ID	Date/Time	Sampling Location	Air Volume (L)	Fungi on MEA @ 25°C	Temperature (ºF)	RH (%)
4-12-1	7/26/00 10:27AM	SSMC-4, 12th floor, hallway @ 12ME1	84.9	1. Basidiomycetes (8*) 2. yeast (1) CFU/m^3 = 106	74.4	44.1
4-12-2	7/26/00 10:40AM	SSMC-4, 12th floor, room 12502	84.9	1. *Cladosporium* (1) 2. *Penicillium* (1) 3. Basidiomycetes (10) CFU/m^3 = 141	73.9	42.6
4-12-3	7/26/00 10:55AM	SSMC-4, 12th floor, room 12309	84.9	1. *Alternaria* (2) 2. *Cladosporium* (2) 3. Basidiomycetes (5) CFU/m^3 = 106	75.2	41.4

4-12-4	7/26/00 11:05AM	SSMC-4, 12th floor, room 12310	84.9	1. *Alternaria* (2) 2. *Cladosporium* (1) 3. Basidiomycetes (5) CFU/m^3 = 94	74.4	42.7
4-11-1	7/26/00 11:20AM	SSMC-4, 11th floor, hallway @ ME1	84.9	1. Basidiomycetes (5) CFU/m^3 = 59	75.6	37.0

Sample ID	Date/Time	Sampling Location	Air Volume (L)	Fungi on MEA @ 25°C	Temperature (ºF)	RH (%)
4-11-2	7/26/00 11:35AM	SSMC-4, 11th floor, room 11644	84.9	1. *Penicillium* (1) 2. Basidiomycetes (4) 3. yeast (1) CFU/m^3 = 71	73.8	42.5
4-11-3	7/26/00 11:45AM	SSMC-4, 11th floor, room 11346	84.9	1. *Penicillium* (1) 2. Basidiomycetes (10) CFU/m^3 = 130	74.2	43.3
4-11-4	7/26/00 12:00PM	SSMC-4, 11th floor, cubicle across from room 11239	84.9	1. *Cladosporium* (1) 2. *Paecilomyces* (1) 3. Basidiomycetes (6) CFU/m^3 = 94	76.3	40.5
FB	7/26/00 12:04PM	Field blank @ cubicle across from SSMC-4, room 11239	NA#	No fungal growth	75.9	40.8
2-18-1	7/26/00 1:15PM	SSMC-2, 18th floor, hallway outside room 18122	84.9	1. *Aureobasidium* (2) 2. Basidiomycetes (1) CFU/m^3 = 35	74.4	50.0
2-18-2A	7/26/00 1:28PM	SSMC-2, 18th floor, room 18111	84.9	1. Basidiomycetes (2) CFU/m^3 = 24	72.0	50.8

2-18-2B	7/26/00 1:32PM	SSMC-2, 18th floor, room 18111	84.9	1. Basidiomycetes (1) CFU/m^3 = 12	73.1	49.2
2-18-3	7/26/00 1:43PM	SSMC-2, 18th floor, room 18324	84.9	1. Basidiomycetes (1) CFU/m^3 = 12	72.5	49.6
2-18-4	7/26/00 1:56PM	SSMC-2, 18th floor, hallway @ 18ME1	84.9	No fungal growth CFU/m^3 < 12	73.7	47.3
2-17-1	7/26/00 2:08PM	SSMC-2, 17th floor, hallway @ 17ME1	84.9	1. *Alternaria* (1) 2. Basidiomycetes (2) CFU/m^3 = 35	74.6	43.0
2-17-2	7/26/00 2:20PM	SSMC-2, 17th floor, room 17110	84.9	1. Basidiomycetes (2) CFU/m^3 = 24	75.2	41.9
2-17-3	7/26/00 2:33PM	SSMC-2, 17th floor, outside of room 17128	84.9	1. *Mucor* (1) CFU/m^3 = 12	74.3	43.5
2-17-4	7/26/00 2:45PM	SSMC-2, 17th floor, room 17324	84.9	1. *Aspergillus sp.* (1) 2. yeast (1) CFU/m^3 = 24	75.4	41.3
Out-2	7/26/00 3:04PM	Outside SSMC-2	28.3	1. *Aspergillus sp.* (2) 2. *Cladosporium* (2) 3. *Aureobasidium* (1) 4. Basidiomycetes (114) CFU/m^3 = 4,205	73.8	75.6
3-15-1	7/26/00 3:20PM	SSMC-3, 15th floor, hallway @ 15ME2	84.9	1. *Aspergillus niger*** (1) 2. Basidiomycetes (2) CFU/m^3 = 35	72.5	42.3

Sample ID	**Date/Time**	**Sampling Location**	**Air Volume (L)**	**Fungi on MEA @ 25°C**	**Temperature (ºF)**	**RH (%)**

3-15-2	7/26/00 3:31PM	SSMC-3, 15th floor, room 15547	84.9	1. *Mucor* (1) CFU/m^3 = 12	73.0	41.2
3-15-3	7/26/00 3:45PM	SSMC-3, 15th floor, room 15348	84.9	1. *Mucor* (1) 2. Basidiomycetes (1) CFU/m^3 = 24	74.4	38.0
3-15-4	7/26/00 3:59PM	SSMC-3, 15th floor, room 15872	84.9	No fungal growth CFU/m^3 < 12	73.9	39.6
3-14-1	7/26/00 4:13PM	SSMC-3, 14th floor, hallway @ 14ME2	84.9	1. *Aureobasidium* (1) 2. Basidiomycetes (3) CFU/m^3 = 47	72.4	42.2
3-14-2	7/26/00 4:30PM	SSMC-3, 14th floor, room 14555	84.9	1. *Aureobasidium* (2) 2. Basidiomycetes (1) CFU/m^3 = 35	71.6	43.0
3-14-3	7/26/00 4:37PM	SSMC-3, 14th floor, room 14703	84.9	1. *Cladosporium* (1) 2. *Penicillium* (1) 3. Basidiomycetes (1) CFU/m^3 = 35	73.3	40.7

Sample ID	**Date/Time**	**Sampling Location**	**Air Volume (L)**	**Fungi on MEA @ 25°C**	**Temperature (ºF)**	**RH (%)**
3-14-4	7/26/00 4:52PM	SSMC-3, 14th floor, room 14837	84.9	No fungal growth CFU/m^3 < 12	72.0	42.1

Out-4	7/26/00 5:09PM	Outside SSMC-3	28.3	1. *Cladosporium* (5) 2. *Aureobasidium* (2) 3. *Aspergillus versicolor**** (1) 4. *Mucor* (1) 5. Basidiomycetes (123) CFU/m^3 = 4,664	71.5	81.9

* Colony counts. ** Opportunistic fungi. *** Toxigenic fungi. # Not applicable.